

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: December 24, 1992
TO: R. Blumberg
FROM: G. Schroeder *JS*
SUBJECT: NSLS 200 MeV Accelerator NESHAPs Evaluation

As required by the Clean Air Act, the use of the proposed NSLS 200 MeV Accelerator as outlined in its Preliminary Safety Assessment Report (PSAR), has been evaluated for compliance with the air emission standards set forth in 40 CFR 61, Subpart H. The dosimetric impact to the nearest off-site resident is projected to be substantially less than the administrative level (0.1 mrem per year) that requires formal submission to the EPA for a NESHAPs permit to construct/operate the facility. The attached evaluation is your record that the assessment was performed by the S&EP Division. It should be maintained in your records as a compliance document. Should you alter the operating conditions of the facility such that it might affect the atmospheric radionuclide output estimated within the evaluation, the conclusions drawn will need to be reassessed.

BLC\EC5220.92
Attachment

cc: W. Casey w/o attachment
M. Davis "
R. Miltenberger with attachment
C. Polanish, DOE "

REQUEST FOR APPROVAL TO CONSTRUCT OR MODIFY
SOURCES OF ATMOSPHERIC EMISSIONS OF RADIONUCLIDES

Prepared by
G. Schroeder
December 22, 1992

I. NAME AND ADDRESS OF APPLICANT

U. S. Department of Energy
Area Manager: Dr. Carson Nealy
50 Bell Avenue
Building 464
Upton, New York 11973

II. NAME AND LOCATION OF SOURCE

Name: NSLS 200 MeV Linear Electron Accelerator Injector, Bldg. 729
Location: Brookhaven National Laboratory
Upton, New York 11973

Latitude: N 40° 52'
Longitude: W 72° 53'

DESCRIPTION:

The National Synchrotron Light Source (NSLS) 200 MeV Linear Electron Accelerator Injector will be located on the reservation of Brookhaven National Laboratory. Brookhaven National Laboratory is a multidisciplinary scientific research center located close to the geographic center of Suffolk County on Long Island, about 97 km east of New York City. Its location with respect to surrounding communities is shown in Figure 1. About 1.4 million persons reside in Suffolk County and approximately 0.41 million persons reside in Brookhaven Township, the municipality within which the Laboratory is situated. The distribution of residential population within 80 km of the BNL site is also shown in Figure 1.

The site map in Figure 2 shows general features of the BNL facility. The electron linac in Bldg. 729 will be located to the east of the NSLS facility on Brookhaven Avenue. Nearby residences along with an approximate location of the planned facility are indicated in Figure 3. A topographic map of the BNL reservation has been previously provided as part of the 40 CFR 61.07 Application for Permit to Modify BNL Building 705.

III. RELEASE POINT INFORMATION

Emission Point ID:	0729-NSLS
Stack height (ft.):	N/A
Exit velocity (ft./sec):	N/A
Exhaust temp. (°F):	ambient

IV. TECHNICAL INFORMATION ABOUT THE SOURCE

A. Overview of Operations

The NSLS electron linac will be a conventional S-band RF accelerator intended to serve as an injector for an electron storage ring. The storage ring will provide a source of far-ultraviolet photons for a prototype projection lithography system.

B. Ventilation System Description

Since there are no exhaust stacks involved, the release of radionuclides has been assumed to occur about five meters above ground level. This produces a more conservative estimate of resulting doses than assuming a ground level release.

The building air handling system is designed to provide fresh air at a minimum intake rate of 600 CFM. For purposes of this review, it is assumed that the building air exhaust rate via gaps in wall construction, doorways, etc. is equal to this intake rate.

C. Source Term Development

The source term generated by the operation of the Bldg. 729 linac results from air activation caused by beam losses (note that the beam transport system is designed with no air path for the primary electron beam). The source term estimates are based on saturation activities calculated for the Accelerator Test Facility (ATF) linac at 50 MeV and a beam power of 8 watts. These ATF saturation activity estimates have been scaled by taking into account the corresponding Bldg. 729 beam energy, power and pulse frequency (see B. 729 Preliminary Safety Analysis Report). The principal isotopes produced by these beam losses are ^{13}N ($t_{1/2} = 10$ min.) and ^{15}O ($t_{1/2} = 2$ min.). It is estimated that the maximum saturation activity values for these radionuclides occur when the beam is operated at 200 MeV, 3.12×10^{10} e⁻/pulse at 10 Hz. The resulting nuclide concentrations are 1.09×10^{-7} $\mu\text{Ci}/\text{cm}^3$ of ^{13}N and 1.16×10^{-8} $\mu\text{Ci}/\text{cm}^3$ of ^{15}O . Assuming a very conservative beam operation time of 2000 hrs/yr, and a ventilation rate of 600 CFM, the maximum annual source term releases of ^{13}N and ^{15}O is 0.22 Ci and 0.023 Ci, respectively.

D. Dose Assessment

The radiological impacts to the off-site public have been estimated with the CAP-88 modeling code. A site-specific model was utilized with 10 year average meteorology information (wind rose, temperature, and precipitation).

The facility specific impact to the maximally exposed individual at a distance of 750 m north of the emission point are presented in Table 1. The collective doses are also shown in Table 1. Note that while 750 m north is still on the BNL site, doses farther from the

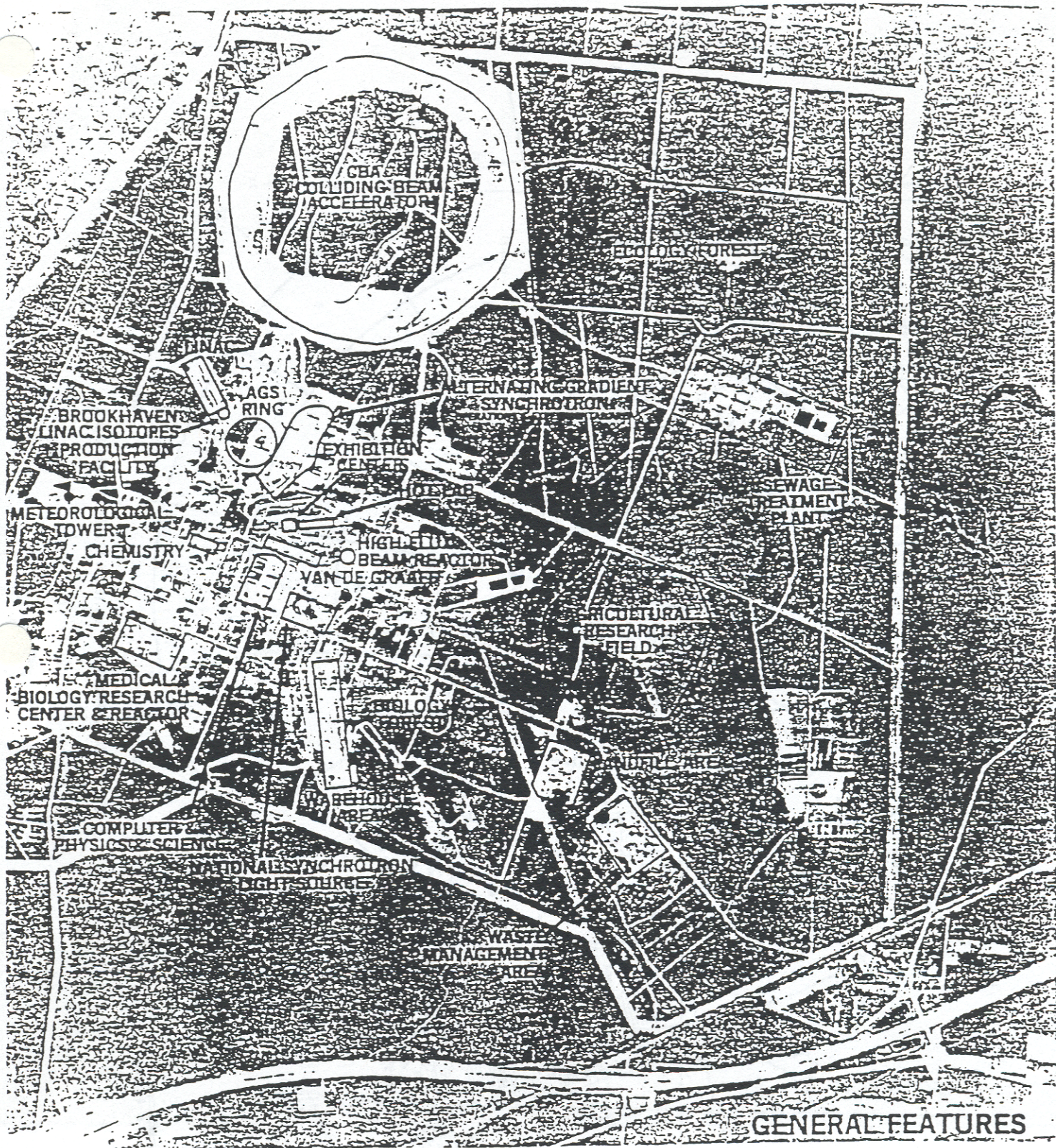
emission point, off site, would be even less.

For the source terms discussed in Section IV.C, the maximum individual's whole body dose is $6.48\text{E-}5$ mrem per year. The collective dose from the operation of this source would be $6.89\text{E-}5$ person-rem per year. The maximum individual total body dose is much smaller than the 0.1 mrem per year dose that triggers the formal permitting process by EPA (December 15, 1989 Federal Register).

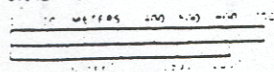
TABLE 1

NUCLIDE	RELEASE (Ci/yr)	MAXIMUM INDIVIDUAL WHOLE BODY DOSE (mrem/yr)	COLLECTIVE POPULATION DOSE (person-rem/yr)
O-15	$2.2\text{E-}1$	$1.42\text{E-}6$	$1.16\text{E-}6$
N-13	$2.3\text{E-}2$	$6.33\text{E-}5$	$6.77\text{E-}5$
Total		$6.48\text{E-}5$	$6.89\text{E-}5$

BLC



OVERLAY FOR BASE 1, BROOKHAVEN



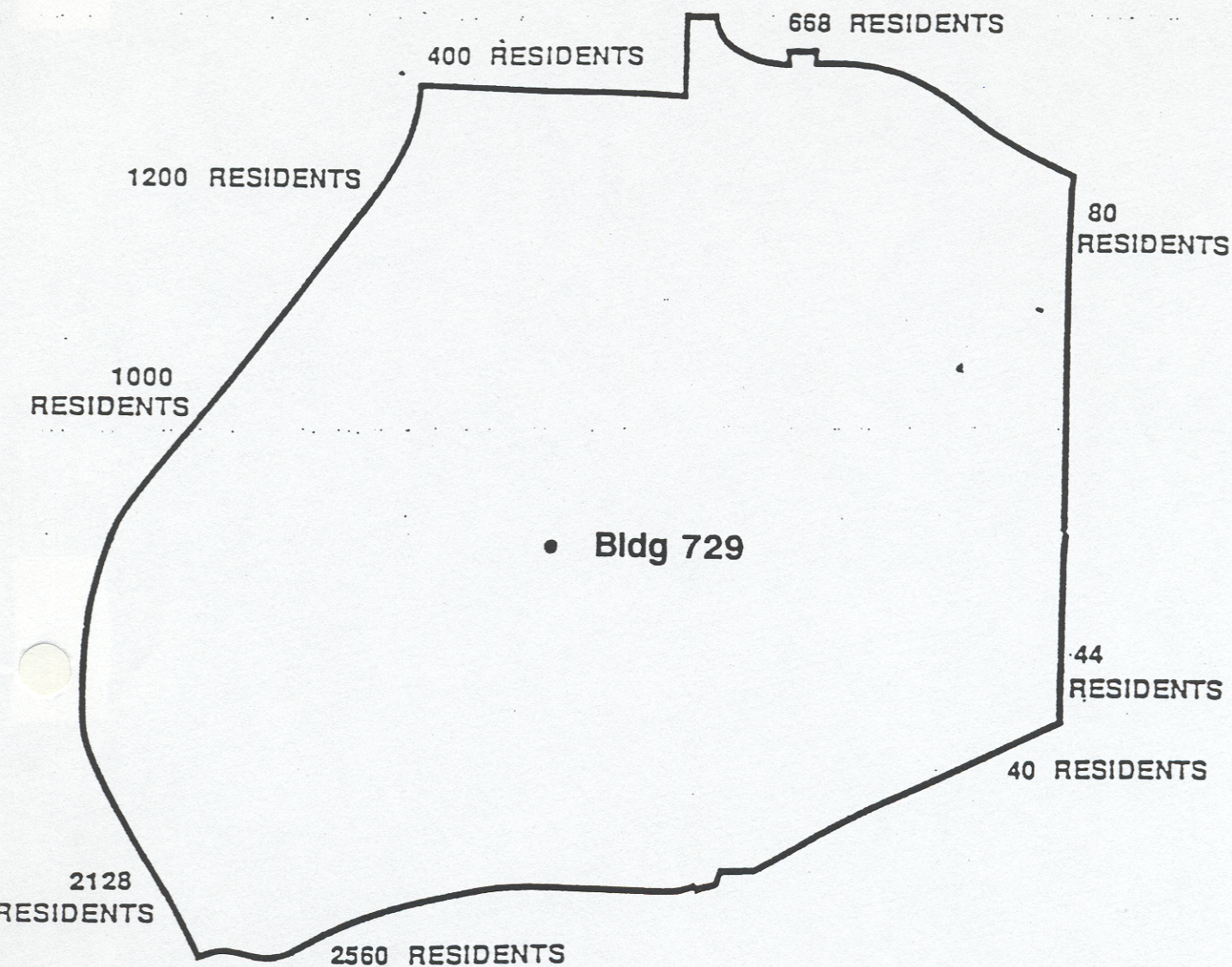
BROOKHAVEN NATIONAL LABORATORY

SCALE: 1:50,000
DATE: 1981

PREPARED IN 1983
FOR DOE
BY EG&G

BASE 3 GENERAL FEATURES

FIGURE 1



BROOKHAVEN NATIONAL LABORATORY LOCAL POPULATION DISTRIBUTION

SCALE

0 360 METERS

Figure 3